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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/786,230	02/26/2004	Frank T. Hartley	ION-08	9191

26686 7590 06/28/2005

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EXAMINER

KIM, TAE JUN

ART UNIT	PAPER NUMBER
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3746

DATE MAILED: 06/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/786,230

Applicant(s)

HARTLEY, FRANK T.

Examiner

Ted Kim

Art Unit

3746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-49 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-49 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 1-49 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification fails to disclose the essential components of a thruster including the gas source, the electrodes, the magnets, the controller, the source of the small electric field, the magnetic field to linearly linearly and rotationally accelerate the electron beam (page 9, lines 3+). Due to applicant's lack of disclosure, the claimed disclosure would not be enabled to one of ordinary skill in the art to make and use a thruster. Applicant further discloses on page 10, lines 4-11 that Figure 7 shows an illustration of how the gas expands in a vacuum. This certainly does not show this and this paragraph is also not enabling to show what occurs in this system.
2. The specification does not clearly teach one of ordinary skill in the art to how to create the bipolar thruster (see page 9). The bipolar thruster requires the ions expelled from the front of the thruster and the electrons expelled from the rear of the thruster. It is unclear how this can be accomplished if there is gas flow in the direction 800 countering the flow. Moreover, it is unclear how the gas source would enter in such a situation.
3. Applicant further fails to show where the gas flow 800 comes from, does it come through the accelerator grid 830?

4. Applicant does not define in the specification what is covered by the “means + function language” of claim 49 and hence, it is not clear what is covered by applicant’s usage of this language.

5. Claims 1-49 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement for the reasons set forth above. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 27, 49 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant does not define in the specification what is covered by the “means + function language” of claim 49 and hence, it is not clear what is covered by applicant’s usage of this language.

- Claim 27, “said first and second conductive electrodes” lacks proper antecedent basis.

Response to Amendment

8. The claims filed 2/26/04 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce

new matter into the disclosure of the invention. The added material which is not supported by the original disclosure from the parent applications is as follows: the diversion of the ions and electrons (claims 5, 21, 44, 45). Applicant does not define in the specification any diversion/diverting occurring.

Applicant is required to cancel the new matter in the reply to this Office Action.

Drawings

9. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the small electric field and magnetic field to linearly and rotationally accelerate the electron beam, the use of additional ionization membranes and accelerator elements (e.g. claim 7), the control unit, the polarity of the electrodes being reversed, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing

sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

10. The drawings are objected to because Figure 7 appears to be a substantial duplicate of Figure 2A – if there is no additional purpose for this Figure it should be deleted.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

12. Claim 1, 10, 21-24, 44, 45, are rejected under 35 U.S.C. 102(b) as being anticipated by Webb (3,328,624). Webb teaches ion thrusting system, comprising: an ionization membrane 18 having at least one area through which a gas is passed, and which ionizes the gas molecules passing therethrough to form ions and electrons; and an accelerator element which accelerates the ions to form thrust (not shown but disclosed on col. 1, lines 17+). A tubular body is taught and claims 23, 24 are product by process limitations where the process is given little patentable weight in an apparatus claim.

13. Claims 1, 2, 10, 21-24, 26-28, 30-32, are rejected under 35 U.S.C. 102(b) as being anticipated by Martin (3,328,960). Martin teaches an ion thrusting system, comprising: an ionization membrane C2 (see col. 1, lines 37+) having at least one area through which a gas is passed, and which ionizes the gas molecules passing therethrough to form ions and electrons; and an accelerator element G3 which accelerates the ions to form thrust; the accelerator element G3 is a cathode; a second accelerator element G4 accelerates the ions to

form thrust in a second direction. Since the nozzle N is converging-diverging it is inherently intended for supersonic speeds.

14. Claims 1-6, 10, 21-24, 26-30, are rejected under 35 U.S.C. 102(b) as being anticipated by Harries (3,117,416). Harries teaches an ion thrusting system, comprising: an ionization membrane 5, 6 comprising first and second electrodes having at least one porous area through which a gas is passed, and which ionizes the gas molecules passing therethrough to form ions and electrons; and an accelerator element 11 which accelerates the ions to form thrust; the accelerator element 11 is a cathode; a polarity of the electrodes 5, 6 may be reversed to enhance or inhibit/ reverse the flow (see particularly, col. 4, lines 4-25).

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. Claims 8, 45-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harries (3,117,416) in view of either Hrubby (6,075,321) or Egorov et al (5,218,271) and optionally Beattie et al (5,947,421). Harries teaches an ion thrusting system but does not specifically teach the ion thrusting system the electrodes being spaced less than a mean free path of the molecules to be ionized. Hrubby teaches it is old and well known in the art to make the characteristic length L of the accelerator less than the mean free path (col. 1, lines

27+). Egorov et al teach a plasma/ion accelerator where making the length of the accelerator (which in the case of Harries is longer than the electrode spacing) less than the mean free path is a major condition for efficient operation (col. 1, lines 46+). It would have been obvious to one of ordinary skill in the art to employ space the electrodes less than the mean free path, in order to operate efficiently. As for the use of plural ionization devices, it is old and well known in the art to employ the ion thrusters in arrays and selectively operate them (see e.g. Figure 4) as taught by Beattie for e.g. attitude adjustment in satellites. It would have been obvious to one of ordinary skill in the art to employ plural ionization devices and selectively operate them, in order to provide for attitude adjustment in satellites.

17. Claims 1, 2, 5-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adamo et al (6,577,130) in view of in view of either Hraby (6,075,321) or Egorov et al (5,218,271). Adamo et al teach an ion/plasma thrusting system (see col. 8, lines 55+), comprising: an ionization membrane 85 having at least one area through which a gas is passed (col. 8, lines 34), and which ionizes the gas molecules passing therethrough to form ions and electrons; a potential applied to said ionization membrane may be reversed to thrust ions in an opposite direction (col. 8, lines 41+). The membrane can be an insulating layer/dielectric 62 between a first metal electrode 48 and a second metal electrode 16' and employs either single emitters or multiple emitters/ionization holes. The membrane is so thin that it would appear to be a thickness less than the mean free path. Alternately, Hraby teaches it is old and well known in the art to make the characteristic length L of the accelerator less than the mean free path (col. 1, lines 27+). Egorov et al teach a plasma/ion

accelerator where making the length of the accelerator (which in the case of Harries is longer than the electrode spacing) less than the mean free path is a major condition for efficient operation (col. 1, lines 46+). It would have been obvious to one of ordinary skill in the art to employ space the electrodes less than the mean free path, in order to operate efficiently. The Adamo et al patent does not specifically show the thruster details including an accelerator nor the tubular housing nor the gas delivery system, however, this is old and well known in the art as taught by Martin G3 which uses a tubular housing and a gas delivery system. It would have been obvious to one of ordinary skill in the art to employ an accelerator to enhance the efficiency and/or thrust output of Adamo et al. It would have been obvious to one of ordinary skill in the art to employ a tubular housing with a gas delivery system as a well known configuration used for thrusters. As for the material choices, these are old and well known in the art for their use in electrodes or dielectrics and would have been obvious to use as within the ordinary skill in the art. As for the claimed ranges, these are within the range of the Adamo et al patent and would have been obvious to use as an obvious matter of finding the workable ranges in the art. As for the claimed

18. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over any of the above prior art in view of Killinger et al (6,378,290). The above prior art teach various aspects of the claimed invention but do not teach the housing is quartz. Killinger et al teach making the thruster housing of quartz is well known in the art. It would have been obvious to one of ordinary skill in the art to employ quartz as a well known material used in the art.


Contact Information

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Ted Kim whose telephone number is 571-272-4829. The Examiner can be reached on regular business hours before 5:00 pm, Monday to Thursday and every other Friday.

The fax numbers for the organization where this application is assigned are 703-872-9306 for Regular faxes and 703-872-9306 for After Final faxes.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Thorpe, can be reached at 571-272-4444.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist of Technology Center 3700, whose telephone number is 703-308-0861. General inquiries can also be directed to the Patents Assistance Center whose telephone number is 800-786-9199. Furthermore, a variety of online resources are available at <http://www.uspto.gov/main/patents.htm>

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